



LNG, LPG, liquid & dry bulk terminals



ROYAL HASKONING

thinking in
all dimensions

LNG, LPG, liquid & dry bulk terminals



Clockwise from above: Kissy oil terminal; Sapangar Bay; Port Klang Grain Terminal.

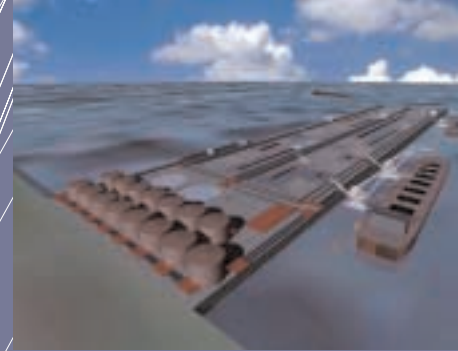
from piping gas to storing grain

The increasing use of LNG and LPG is reducing industrial costs, both in power production and in industrial processes such as the production of aluminium. The desire for improved environmental operating conditions has also encouraged this trend.

The recent upsurge in demand has led to an increase in distribution by pipeline, or where this is not feasible, by specialist shipping. Royal Haskoning, through Posford Haskoning Ltd. and Haskoning Nederland BV, has extensive experience within this sector, and an

understanding of the specialist needs of berths to accommodate LNG and LPG vessels. Our expertise covers a range of aspects, from marine installation and process planning to hazard and risk assessment.

The economies of transporting dry materials such as grain and coal in bulk can be realised with specialist ships and appropriate terminals. Royal Haskoning is able to successfully develop bulk terminals through a close integration of civil engineering, mechanical handling and operations management.



Clockwise from above: LNG Tank, Bintulu; Venterminals; Sapangar unload?; underground storage terminal layout; Aspropyrgos tanker Terminal; New Balac coal terminal.

innovative and economic solutions

Maximising the economies that can be achieved will probably involve consideration of all the bulk transport arrangements. For mined materials this may involve rail transport from the mine to a deep-water port, or a barge system operating on inland rivers may be more cost effective. For grain handling, silos at loading and unloading points minimise ship loading times and hence the long term costs. Automated high capacity conveyor systems can also reduce ship turn-around times. The motions of moored vessels with related fender and mooring forces can be determined using the simulation suite TERMSIM. This analysis often leads to optimised

mooring arrangements and contributes to better predictions of delays of moored vessels.

Royal Haskoning is committed to designing innovative terminal designs and storage concepts. For example, an underwater bulk terminal benefits the environment by reducing dust-emissions. Also, underground oil storage creates an optimal use of space in ports, and contributes to safety and the environment.

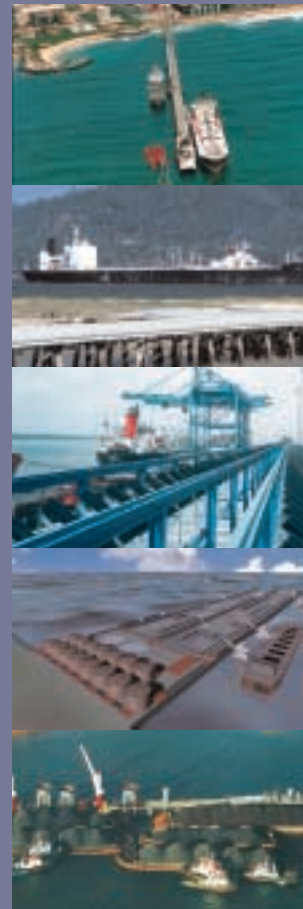
Our team, with its broad range of expertise, can design and implement solutions to generate efficiencies in all these areas.

Royal Haskoning is an independent, worldwide operating consultancy that has its origins in a firm established in 1881 in the Netherlands. The consultancy now has a staff of 3,000 who together combine a wide range of knowledge and experience. Rooted in a technical background, our consultancy services focus on the broad field of the interaction between people and their environment, in the fields of spatial development, infrastructure & transport, architecture & building, mechanical & electrical services, environment, water, coastal & rivers and maritime.

We are committed to working enthusiastically with our clients to achieve sustainable solutions in an increasingly complex society. The expertise and experience of our professionals in a variety of disciplines allow us to

consider all technical, logistical, architectural, legal, organisational, social, environmental and economic aspects of your project, in order to develop sustainable and practical solutions. Royal Haskoning has subsidiaries and partners throughout the world.

Posford Haskoning is the UK branch of Royal Haskoning. Through our branch and project offices in Europe and overseas, we have access to all major international markets. This way, Royal Haskoning offers multidisciplinary and integrated services locally, based on experience built globally. With our personal service in consultancy, we contribute effectively to the successful planning, design, implementation, commissioning and operation of your projects and programmes and enhance our clients' work with added value.



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- ACE The Association of Consulting Engineers
- BCCB British Consultants & Construction Bureau
- PIANC Permanent International Association of Navigation Congresses
- ICHCA International Cargo Handling Co-ordination Association
- CIRIA Construction Industry Research Information Association British Section
- ICID International Commission on Irrigation and Drainage
- IEMA Institute of Environmental and Management Assessment
- FIDIC International Federation of Consulting Engineers

Royal Haskoning through Posford Haskoning Ltd or Haskoning Nederland B.V. is registered with: African Development Bank, Asian Development Bank, Caribbean Development Bank, European Bank for Reconstruction and Development, European Development Fund, International Development Bank, Islamic Development Bank, Kuwait Fund for Arab Economic Development, Overseas Development Administration, United Nations Development Programme World Bank, and many other Funds and National Authorities.

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